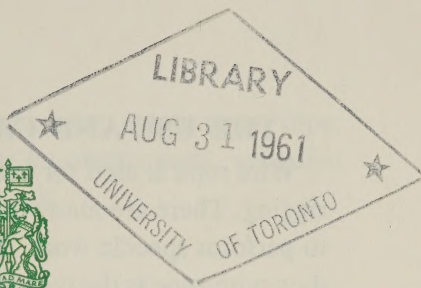


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# THE USE AND CARE OF WIRE ROPE

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**ACCIDENT PREVENTION SERIES No. 10**

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## THE USE AND CARE OF WIRE ROPE

Wire rope is used for heavy lifting and hauling and for rigging. There are many types of wire rope each designed to perform specific work. The most widely used general-duty wire rope is the type known as 6 x 19 wire rope. The numbers indicate that the wire has 6 strands and each strand has 19 wires. Wire ropes that have a higher number of wires in each strand are more flexible but are less resistant to abrasion. Fewer wires per strand increases the resistance to abrasion but reduces the flexibility.

When wire ropes are being used correctly, the load is distributed equally to each wire and strand. Each of the strands bears with equal safe pressure on the core of the rope. Breaking in a new wire rope is important if loads are to be evenly distributed to all strands. New ropes should never be subjected to maximum loads.

The factor of safety for wire rope should be determined by consideration of all pertinent data, which includes type of load, acceleration, deceleration, rope speed, rope attachments, the number, size, and arrangement of sheaves and drums, and possible exposure to moisture and corrosives. If difficulty is encountered in determining the factor of safety, the advice of a reliable wire rope manufacturer should be obtained.

## **Causes of Deterioration**

Deterioration of wire ropes is due largely to the following factors, which vary considerably in importance depending on the conditions of service. For example, corrosion often is the principal cause of deterioration of mine hoisting rope in wet mine shafts because of moisture and the presence of acid in the water. Among other factors are:

1. Wear, particularly on the crown or outside wires, from contact with sheaves and drums.
2. Corrosion, particularly of the interior wires, indicated by pitting. This condition is difficult to detect and highly dangerous. Wear is speeded up by corrosion.
3. Kinks, acquired in improper installation of a new rope, hoisting with slack in the rope, etc., cannot be removed without creating a weak place.
4. Fatigue, indicated by a square break of a wire—a break showing granular structure—due to excessive bending stresses from sheaves and drums with a small radius, whipping, vibration, pounding, and torsional stresses.
5. Drying out of lubrication, often hastened by heat.
6. Overloading and overwinding.





7. Mechanical abuse, such as pinching down and cutting wires or dragging ropes.

The safety and efficiency of hoisting rope installations can be greatly increased by the use of sheaves and drums of suitable size and design, proper lubrication, and good maintenance of the rope and hoisting equipment.

### **Lubrication**

Regular applications of a suitable lubricant to wire rope, designed for hoisting, prevents corrosion, wear from friction and drying out of the core. All lubricants must be noncorrosive. Cleaning fluids should not be used because of their detrimental effect on the core lubricant. Fuel or light oils are sometimes used to loosen the coating of lubricant and harmful materials. A compressed air or steam jet or other mechanical method cleans a rope effectively and thoroughly. Hand methods use a cloth and a brush.

### **Overloading**

Overloading may occur in the operation of most types of hoisting equipment. For example, it is difficult to estimate the load within 25 per cent when making a lift with a crane, and in many instances a load is underestimated by two or three times its weight.



Overwinding likewise may cause stress to a rope, and if a conveyance is caught by obstructions, excessive elongation of the rope may result.

### **Inspection and Replacement**

The frequency of inspection and replacement of a rope depends considerably on service conditions. At regular intervals, a specially trained inspector should examine the ropes on which human life depends. Some mines, for instance, make a daily inspection for readily observable defects, such as kinking and loose wires, and a thorough inspection at least weekly. For the latter inspection, the rope speed is generally less than 60 feet per minute.

Since there is no accurate method of determining the remaining strength of a rope in service, experience and judgment of all factors, combined with the length of time in service and the tonnage hoisted or other unit for judging the work done by the rope, determine when it should be discarded.

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